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FIREARM/TOOLMARK TRAINING MANUAL		Effective Date: 13 May 2003

14 SERIAL NUMBER RESTORATION

14.1 Assignments

14.1.1 Read the Handbook of Methods for the Restoration of Obliterated Serial Numbers, by Tretow. Be prepared to discuss the theory of number restoration.

(Use Training Assignment #61 to complete this objective.)

Training Officer
Date

14.1.2 Sketch the entire stressed area above and below the indentation of a stamped item and depict what remains when the indented area is removed.

(Use Training Assignment #61 to complete this objective.)

Training Officer
Date

14.1.3 Make a list of the various methods used to mark items by private industry. This list should include but not be restricted to: casting, stamping, embossing, debossing, coining, vibratory pencil, laser and electrical discharge machining.

a. Discuss with the Training Officer the effect each of these marking techniques has on the subsurface of the marked area.

b. Discuss with the Training Officer the marking methods used that can directly affect the ability of the examiner to restore any obliterated markings and why.

(Use Training Assignment #61 to complete this objective.)

Training Officer
Date

14.1.4 Define in the notebook the term "*plastic deformation*" of metal.

(Use Training Assignment #61 to complete this objective.)

Training Officer
Date

14.1.5 Briefly discuss in the notebook and with the Training Officer the difference between cold rolled steel and cast iron metal.

(Use Training Assignment #61 to complete this objective.)

Training Officer
Date

14.1.6 Discuss with the Training Officer the effect that the following types of alterations will have on the subsurface of the marked item and how it will impact on the results of the examiner.

- grinding
- over stamping

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<div> <ul style="list-style-type: none"> • pinging • gouging • heating • puddling • welding • removal • combinations of the above </div> <div>(Use Training Assignment #61 to complete this objective.)</div> <div> <div>_____</div> <div>_____</div> <div>Training Officer</div> <div>Date</div> </div> <div> 14.1.7 Determine the telltale signs that can be left by the various alteration methods. Discuss how these signs will determine the specific approach to the restoration attempt. </div> <div>(Use Training Assignment #62 to complete this objective.)</div> <div> <div>_____</div> <div>_____</div> <div>Training Officer</div> <div>Date</div> </div> <div> 14.1.8 Discuss with the Training Officer the different types of lighting (<i>e.g., incandescent, infrared, UV, and fluorescent</i>) and how they can improve or enhance the restoration results. Be prepared to explain how the angle of incidence of these lighting techniques might vary the results. </div> <div>(Use Training Assignment #62 to complete this objective.)</div> <div> <div>_____</div> <div>_____</div> <div>Training Officer</div> <div>Date</div> </div> <div> 14.1.9 Discuss the various methods of surface preparation such as sanding and polishing and how they will affect the results in the restoration attempt. </div> <div>(Use Training Assignment #62 to complete this objective.)</div> <div> <div>_____</div> <div>_____</div> <div>Training Officer</div> <div>Date</div> </div> <div> 14.1.10 Determine the chemical reaction that takes place when etching is conducted and document in the notebook the appropriate chemical formulations for the general reactions of acid with steel and aluminum. </div> <div>(Use Training Assignment #62 to complete this objective.)</div> <div> <div>_____</div> <div>_____</div> <div>Training Officer</div> <div>Date</div> </div> <div> 14.1.11 Determine whether the reaction rate for the stressed area is faster or slower than the etching rate of the rest of the surface and why. </div> <div>(Use Training Assignment #62 to complete this objective.)</div> <div> <div>_____</div> <div>_____</div> <div>Training Officer</div> <div>Date</div> </div>	

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14.1.12 Determine the specialized equipment that might be used in number restoration and discuss this with the Training Officer.

(Use Training Assignment #62 to complete this objective.)

Training Officer

Date

14.1.13 Discuss with the Training Officer the appropriate photography techniques and procedures to be used before, during, and after restoring obliterated serial numbers.

(Use Training Assignment #62 to complete this objective.)

Training Officer

Date

14.1.14 Determine the various types of film utilized for number restoration photography. Be prepared to discuss with your Training Officer under what circumstances each would be used.

(Use Training Assignment #62 to complete this objective.)

Training Officer

Date

14.1.15 Research the various kinds of magnifying and enhancing equipment used for number restoration and explain when and why each would be used.

(Use Training Assignment #62 to complete this objective.)

Training Officer

Date

14.1.16 Become familiar with the following chemicals:

- CuNH_4Cl_2
- CuCl_2
- NaOH
- HCl
- HNO_3
- KCN
- K_2SO_4
- Aqua Regia
- H_2SO_4
- FeCl_3
- H_2O_2
- Tartaric acid
- Ammonium Persulfate

(Use Training Assignment #62 to complete this objective.)

Training Officer

Date

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14.1.17 Obtain the proper safety equipment (*e.g., eyewear, masks, gloves, and lab coats*) before attempting any chemical restorations. Review the chemical hygiene policies to insure proper safety precautions are used.

Training Officer

Date

14.1.18 Define and place in the notebook these common chemical terms:

- Fryes Reagent
- Arais Reagent
- Hydrofluoric acid
- Turner's Reagent
- Davis' Reagent

(Use Training Assignment #63 to complete this objective.)

Training Officer

Date

14.1.19 Become knowledgeable of the numbering systems and methods used by various firearm manufacturers including but not limited to Colt, Ruger, Smith & Wesson, US Repeating Arms (Winchester) and Remington.

(Use Training Assignment #63 to complete this objective.)

Training Officer

Date

14.1.20 Determine the best chemicals and techniques to use in number restoration of the following firearms:

- Colt pistol
- Smith & Wesson revolver
- RG Industries revolver
- Ruger stainless steel revolver
- chrome/nickel 25 caliber autoloading pistol
- shotgun alloy receiver
- shotgun case hardened receiver
- Winchester rifle

(Use Training Assignment #63 to complete this objective.)

Training Officer

Date

14.1.21 Obtain several firearms from the Training Officer, alter the serial numbers using different methods and then attempt to restore them. Prepare notes and photographs to substantiate all conclusions and results.

(Use Training Assignment #63 to complete this objective.)

Training Officer

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<p>14.1.22 Be prepared to discuss with the Training Officer the methods used and lessons learned during the restoration process.</p> <p><i>(Use Training Assignment #63 to complete this objective.)</i></p> <p>_____ Training Officer</p> <p>_____ Date</p> <p>14.1.23 Obtain several pieces of aluminum that have had stamped numbers removed. Attempt to restore these numbers using various techniques. Prepare notes and photographs to substantiate all conclusions and results.</p> <p>_____ Training Officer</p> <p>_____ Date</p> <p>14.1.24 Discuss with the Training Officer how the combination of brief application of CuNH_4Cl_2 followed by normal NaOH application can shorten the processing time on aluminum.</p> <p><i>(Use Training Assignment #63 to complete this objective.)</i></p> <p>_____ Training Officer</p> <p>_____ Date</p> <p>14.1.25 Discuss with the Training Officer why alternating HNO_3 and HCl can work so well on chrome or nickel plated firearms.</p> <p><i>(Use Training Assignment #63 to complete this objective.)</i></p> <p>_____ Training Officer</p> <p>_____ Date</p> <p>14.1.26 Research the effect of D. C. electricity (Include the proper polarity and voltage for enhance etching/development of obliterated numbers and letters) on the reaction time of the different chemical techniques that have been learned. Conduct restorations using this method.</p> <p><i>(Use Training Assignment #63 to complete this objective.)</i></p> <p>_____ Training Officer</p> <p>_____ Date</p> <p>14.2 Reference Materials Restoration of Obliterated Markings</p> <p>The following reference materials serve several purposes:</p> <ul style="list-style-type: none"> • To provide a wider range of additional resources in a given topic • To provide reference materials for future use • To gain additional in depth knowledge in a particular subject area <p>Other references encountered in this category should be made as additional notes at the end of this listing.</p> <p>14.2.1 Books</p> <p>Brandt, D., <u>Metallurgy Fundamentals</u>, Goodheart-Wilcox Co., Inc., 1992.</p>	

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<p>Cook, C.W., "A Practical Guide to the Basics of Physical Evidence" <u>Colorado Bureau of Investigation</u>, April 1975.</p> <p>Cook, C.W., "Chemical Etching Reagents for Serial Number Restoration" <u>Colorado Bureau of Investigation</u>, April 1975.</p> <p>Doane, F.B., <u>Principles of Magnaflux Inspection</u>, Photopress Publishing, Inc., 1940.</p> <p>Hatcher, J.S., Jury, F.J., and Weller, J., <u>Firearms Investigation, Identification and Evidence</u>, 2nd edition, Stackpole Books, Harrisburg, PA, 1977.</p> <p>Hein, Morris, et al., <u>Foundations of College Chemistry</u>, Dickenson Publishing Co., 1977.</p> <p>Kegser, C.A., <u>Basic Engineering Metallurgy - Theories, Principles and Applications</u>, 6th edition, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1957.</p> <p>Kehl, G.L., <u>The Principles of Metallographic Laboratory Practice</u>, 3rd edition, McGraw-Hill, New York, 1949.</p> <p>Kotz and Purcell, <u>Chemistry and Chemical Reactivity</u>, Saunders College Publishing, 1991.</p> <p>Krcma, V., <u>The Identification and Registration of Firearms</u>, Charles C. Thomas, Springfield, IL, 1971.</p> <p>Mathews, J.H., <u>Firearms Identification</u>, Volume I, Charles C. Thomas, Springfield, IL, 1962, pp. 77-80.</p> <p>Polk, D.E., and Giessen, B.C., <u>Metallurgical Aspects of Serial Number Recovery</u>, Institute of Chemical Analysis-Northeastern University, Boston, MA (undated).</p> <p>Treptow, R.S., <u>Handbook of Methods for the Restoration of Obliterated Serial Numbers</u>, NASA, 1978.</p> <p>Vander Voort, G.F., <u>Metallography, Principles and Practice</u>, McGraw-Hill, 1984.</p> <p>Van Klock, L.H., <u>Elements of Materials Science and Engineering</u>, Addison-Wesley Publishing Company, 1985.</p> <p>14.2.2 Professional Journals</p> <p>Katterwe, H., "Modern Approaches For the Examination of Toolmarks and Other Surface Marks," <u>Forensic Science Review</u>, Vol. 8, No. 1, Jun. 1996, pp. 46-71.</p> <p>"The Recovery of Erased Numbers in Polymers," <u>Journal of Forensic Science Society</u>, Vol. 34, 1994, pp. 11-16.</p> <p>Krcma, V., "The Identification of Pistols by Serial Numbers and Other Markings," <u>Journal of Forensic Sciences</u>, 1961.</p> <p>"Metallurgy vs. Crime," <u>FBI Law Enforcement Bulletin</u>, Vol. 19, No. 11, Nov. 1950, p. 8.</p> <p>"Restoring Altered and Obliterated Markings on Metal," <u>FBI Law Enforcement Bulletin</u>, Vol. 25, No. 7, Jul. 1956, p. 13.</p> <p>Thorton, J.I., and Cashman, P.J., "The Mechanism of the Restoration of Obliterated Serial Numbers by Acid Etching," <u>Journal of the Forensic Science Society</u>, Vol. 16, No. 69, 1976.</p>	

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<p>Turley, D.M., "Restoration of Stamp Marks on Steel Components by Etching and Magnetic Techniques," <u>Journal of Forensic Sciences</u>, Vol. 32, No. 3, May 1987.</p> <p>Young, S.G., "The Restoration of Obliterated Markings by Ultrasonically Induced Cavitation in Water," <u>Journal of Forensic Sciences</u>, Vol. 19, No. 4, 1974, p. 820.</p> <p>14.2.3 AFTE Journal</p> <p>Barabash, T., and Fahey, R.T., "Non-Destructive Methods of Restoring Defaced Serial Numbers," 1977; 9(1):23.</p> <p>Brundage, D.J., "Surface Preparation for Serial Number Restoration," 1982; 14(4):9.</p> <p>Cantor, A., "Serial Number Restoration with Image Enhancement on the FBI Drugfire Computer," 1997; 29(2):223-230.</p> <p>Cook, C.W., "Chemical Etching Reagents for Serial Number Restoration," 1975; 7(2):80.</p> <p>"Obliterated Serial Numbers," 1975; 7(1):27.</p> <p>"Obliterated Serial Numbers," 1989; 21(2):166-167.</p> <p>Deats, B., "Serial Number Restoration Information," 1980; 12(3):82.</p> <p>Dragan, P., "Abrasive Wheels for Serial Number Restoration Preparation," 1996; 28(1):21.</p> <p>Garland, P.V., "Training the Firearms Examiner," 1971; 3(1):32.</p> <p>Harden, L.R., "Reader Reporter," 1988; 20(2):171-173.</p> <p>Heflin, T.M., "Examination of Serial Number Over-Stamp," 1984; 16(3):12.</p> <p>Hueske, E.E., "Browning Firearms Serial Numbering System," 1988; 20(1):59-60.</p> <p>Keisler, M.A., "Smith and Wesson Model SW9F and the Hidden Serial Number," 1997; 29(2):186-187.</p> <p>Knowles, M., "Instant Recovery of Obliterated Serial Numbers," 1985; 17(3):63.</p> <p>Lee, F.R., "Helpful Hint," 1977; 9(2):37.</p> <p>Lutz, M.C., "Evaluation of New Fiber Optics System," 1986; 18(1):12.</p> <p>Massiah, E.E., "Compilation of Techniques and Chemical Formulae Used in the Restoration of Obliterated Markings," 1976; 8(2):26.</p> <p>Miller, J., "Book Review: The Law and Forensic Ballistics by T.A. Warlow," 1997; 29(2):239, 173.</p> <p>Miller, K.E., "Current Assist for Die Stamp Impression Restoration," 1972; 4(3A):38.</p> <p>Montgomery, J.L., "New Process Restores Filed Serial Numbers," 1975; 7(3):80.</p> <p>Nielson, B.C., "Restoration of Die Stamped Impressions on Metal," 1972; 4(3):32.</p> <p>O'Reilly, W.E., "Magnetic Restoration of Serial Number," 1970; 2(3):26.</p>	

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<p>Paholke, A.R., "Restoration of Serial Numbers," 1969; 1(4):38.</p> <p>Polk, D.E., and Giessen, B.C., "Metallurgical Aspects of Serial Number Recovery," 1975; 7(2):38.</p> <p>"Metallurgical Aspects of Serial Number Recovery," 1989; 21(2):174-181.</p> <p>Roberts, V., "Restoration of Serial Numbers in Plastic," 1981; 13(4):40.</p> <p>Schaefer, J.R., "Serial Number Restoration Observation," 1987; 19(3):276-278.</p> <p>Sherlock, W.E., and Keating, D.M., "Obliterated Serial Number Tracking Program," 1995; 27(4):264-280.</p> <p>Taulbee, D., "3x5 Card File of Die Stamped Impressions on Metal," 1973; 5(3):18.</p> <p>Thompson, R.W., "Second Serial Number on Tarus Model 80 Revolvers," 1980; 12(2):18.</p> <p>Vaughan, R.T., "Serial Number Restoration on a Radar Warning Device," 1987; 19(3):304.</p> <p>"Technique for Restoring Obliterated Serial Numbers on Plastic Cards," 1981; 13(2):30.</p> <p style="text-align: right;">◆ End</p>	